AMENDMENT

Notification No.18

Amendment No. 1/ IRC:SP:80/November, 2018 (Effective from the 31st January, 2019)

To

IRC:SP:80:2008 " Guidelines for Corrosion prevention , Monitoring and Remedial Measures for Concrete Bridge Structures"

Sl. No.	Clause No. (Page No.)	For	Read
1.	4.1.7 (Page 14)	**----------.** The level of carbon-dioxide penetrates into the pores of concrete by diffusion and reacts with the calcium hydroxide dissolved in the pre water. ----------	----------. The level of carbon-dioxide penetrates into the pores of concrete by diffusion and reacts with the calcium hydroxide dissolved in the pore water. ----------
2.	5.1 (Page 14)	Crack width should be controlled and kept to the minimum. Provisions given in Table 5.1 as per IRC:21, strive to achieve it by controlling the bar diameters and spacing. Alternatively, crack widths as calculated by formula given in Appendix-I and IRC:21 are recommended for achieving the same. It will be generally applicable to RC members and non stressed members. For members where crack width cannot be calculated, it should be controlled by using well distributed steel not exceeding spacing of 200 mm dia. In pre-stressed concrete members also, this early age shrinkage and thermal cracks should be controlled by minimum level of reinforcement similarly placed not greater than 200 mm spacing.	Crack width should be controlled and kept to the minimum. For allowable crack width in different environmental conditions both for reinforced and pre-stressed concrete members, provisions for bar spacing, maximum bar size and minimum reinforcement under section of IRC:112 may be referred to.
3.	5.3.5 (Page 16)	Water used shall not contain oil, acids, alkalis, sugar, and organic materials which may be deleterious to concrete and steel and shall generally conform to provisions contained in IRC:21-2000, IS:3025 and IS:456.	Water used shall not contain oil, acids, alkalis, sugar, and organic materials which may be deleterious to concrete and steel and shall generally conform to provisions contained in IRC:112-2011.
4.	5.5 Table 5.1 (Page 17)	Table 5.1 : Requirements to prevent/control corrosion (Existing table enclosed at **Annex-I**)	Table 5.1 : Requirements to prevent/control corrosion (New table enclosed at **Annex-II**)
5.	5.5 Table 5.2 Page 22	IS:456:2000, IRC:SP:70-2005 (In the forth column)	IRC:SP:70
6.	5.6.1 (Page 22)	----------. However, the current codes of practices have generally divided the conditions of exposure of the structural elements based on the general atmospheric environment in to two classes: Severe and Moderate. The moderate includes all conditions except what is described as 'Severe' (Ref. IRC:21).	----------. However, the current codes of practices have generally divided the conditions of exposure of the structural elements based on the classification of service environment in to four classes: Extreme, Very Severe, Severe and Moderate.

7.	5.6.2 Table 5.3 (Page 23)	Concrete in Severe Environment (In first row and second column)	Concrete in Extreme, Very severe and Severe Environment (In first row and second column)
8.	5.6.2 Table 5.3 (Page 23)	IRC:21-2000 (In the first row and forth column)	IRC:112
9.	5.6.2 Table 5.3 (Page 23)	Use of galvanized steel as reinforcement is effective. Powder coating with epoxy can also be used. (Fifth row and second column)	Use of galvanized steel and stainless steel as reinforcement is effective. Powder coating with epoxy can also be used.
10.	6.1 and 6.1.1(b) (Page 24 & 25)		1. Delete line 'Zink + Aluminium Coating' 2. Delete 6.1.1(b)
11.	6.2.4.3.2 (Page 35)	Last line 'The grouting should be carried out as specified in IRC:18-2000'	'The grouting should be carried out as specified in IRC:112
12.	6.5.1 Table 6.6 (Page 37)	Table 6.6 : Requirements for Acrylic Elastomeric coating (Existing table enclosed at **Annex-III**)	Table 6.6 : Requirements for Acrylic Elastomeric coating (New table enclosed at **Annex-IV**)

Annex-I

IRC: SP: 80 – 2008

Table 5.1

<table>
<tr><th>Sr. No.</th><th>Parameters</th><th colspan="2">Requirement</th><th>Reference</th></tr>
<tr><td colspan="5">A. DESIGN STAGE</td></tr>
<tr><td>1.</td><td>Crack width</td><td colspan="2">A) Average stain value calculated as per specified formula should be negative.
B) Crack width under sustained loads shall not exceed 0.2 mm for severe conditions of exposure and 0.3 mm for moderate conditions.</td><td>IRC:21-2000
Clause 303.4.2
Appendix-1</td></tr>
<tr><td>2.</td><td>Clear Cover for Reinforcement</td><td>Exposure

Moderate
Severe
Alternate
Wetting & Drying Zone</td><td>Nominal Cover
(in mm)

40
50
75</td><td>IRC:21-2000
Clause 303.4.3</td></tr>
<tr><td></td><td></td><td colspan="2">Note: the above cover may be reduced by 5 mm for factory made precast products with higher level of quality assurance.</td><td></td></tr>
<tr><td>3.</td><td>Cover for pre-stressing steel and spacing</td><td colspan="2">• Wherever pre-stressing cable is nearest to concrete surface the minimum clear cover measured from outside of sheathing shall be 75 mm.
• A minimum clear distance of 50 mm or diameter of the duct whichever is greater shall be maintained between individual cable.</td><td>IRC:18-2000
Clause 16.1, 16.3</td></tr>
</table>

<table>
<tr><th>Sr. No.</th><th>Parameters</th><th>Requirement</th><th>Reference</th></tr>
<tr><td>4</td><td>Grouping of cables</td><td>Grouping of cables shall be avoided to the extent possible. If unavoidable, only vertical grouping of cables upto 2 cables shall be permitted.
In case of severe condition of exposure grouping of cables shall be altogether avoided.
This may be achieved by use of high capacity strands.</td><td>IRC:18-2000 Clause 16.4</td></tr>
<tr><td>5</td><td>Proper detailing and spacing of steel</td><td>Attention should be given to detailing to ensure proper concretability, use of vibrators etc.</td><td></td></tr>
<tr><td colspan="4">B. MATERIALS</td></tr>
<tr><td>6</td><td>• Coarse Aggregates
• Fine Aggregates</td><td>• The preferred nominal size of aggregate is 20 mm for pre stressed and reinforced concrete. It should consist of natural sand crushed stone or gravel. It should not contain dust, lumps, soft or flaky particles, mica and other deleterious materials.
• Concrete should be kept wet at least for 14 days.</td><td>IS:383 & IRC:21-2000</td></tr>
<tr><td>7</td><td>Water</td><td>Should not contain injurious amounts of oil acids, alkalis, sugar and organic materials, which may be deleterious to concrete and steel.
Permissible limits of solids shall be as under:
Organic-200 mg/l
Inorganic-3000 mg/
Sulphates-400 mg/l
Cholorides-500 mg/l (RCC)
Suspended matter-2000 mg/l
• pH Value-6
• Use of Sea Water is not allowed</td><td>IRC:21-2000 & IS:3025</td></tr>
<tr><td>8</td><td>Reinforcement</td><td>a) Following grades of reinforcement steel shall be used:
• Grade S-240 Mild Steel
• Grade S-415-Deformed bars
• Grade S-500-Deformed bars
b) Coated bar
• Galvanised zinc aluminum coating
• Fusion bonded epoxy coating</td><td>IS:432-Part I.
IS:1786
As per relevant standards detailed under Chapter-6</td></tr>
<tr><td>9</td><td>Concrete</td><td>Cement content shall not exceed
450 kg/m^3 of concrete
Minimum cement content for various structural members and different exposure conditions shall be as under:
<table>
<tr><th>Structural Member</th><th>Moderate Exposure</th><th>Severe Exposure</th><th>Min Cement Content</th></tr>
<tr><td>PCC Member</td><td>M-25</td><td>M-30</td><td>360 kg/m^3</td></tr>
<tr><td>RCC Members</td><td>M-30</td><td>M-35</td><td>380 kg/m^3</td></tr>
<tr><td>PSC Members</td><td>M-35</td><td>M-40</td><td>400 kg/m^3</td></tr>
<tr><td>HPC Members</td><td>--</td><td>M-40</td><td>380 kg/m^3 with Admixture 450kg/m^3 without Admixtures</td></tr>
</table></td><td></td></tr>
</table>

<table>
<tr><th>Sr. No.</th><th>Parameters</th><th>Requirement</th><th>Reference</th></tr>
<tr><td></td><td></td><td>Sulphate Content (SO_3) shall not exceed 4% by mass of cement used in the mix of concrete. In severe condition, this should be limited to 2%
Chloride content in concrete shall not exceed following value by mass of cement:
PSC-0.1 %
RCC-Severe exposure 0.2 %
RCC-(Moderate) 0.3 %
The above value shall be respected in case of HPC also</td><td>IRC:21-2000
Clause 302.6.5

IRC:SP:70-2005
IRC:21-2000
Table -5</td></tr>
<tr><td></td><td>Water Cement Ratio</td><td>Maximum water cement ratio should be maintained as under:
<table>
<tr><th>Member</th><th>Normal Exposure</th><th>Severe Exposure</th></tr>
<tr><td>PCC</td><td>0.45</td><td>0.45</td></tr>
<tr><td>RCC</td><td>0.45</td><td>0.40</td></tr>
<tr><td>PSC/HPC</td><td>0.40</td><td>0.40</td></tr>
</table></td><td></td></tr>
<tr><td>10</td><td>Sheathing</td><td>• Use Corrugated HDPE Duct. They are especially recommended to serve as barrier to externally penetrating chlorides/sulphates.
• Whenever feasible, metallic ducts may be manufactured at site to eliminate along storage period and thereby corrosion problem.
• To prevent corrosion on outer side surface should be applied with washable water soluble oil/VPL Power injection.</td><td></td></tr>
<tr><td colspan="4">C. Construction Stage</td></tr>
<tr><td>1.</td><td>Curing</td><td>Concrete shall be kept atleast for 14 days.
Steam or other improved method of curing wherever necessary should be used.</td><td>IRC:21-2000</td></tr>
<tr><td>2.</td><td>Storage and Handling of Pre-stressing Material</td><td>All pre-stressing elements such as strands/ IRC:18-2000 wires, anchorages, ducts, couplers, should Appendix-3 be protected. These materials should be stored in such a way that there is no deterioration in quality and usage in the work. These should be protected from rain, damp ground, ambient temperature by covering them properly. These should be coated with soluble oil, silica gel or vapour phase inhibiting materials.
The HTS strands should be wrapped in HDPE wrappers. The steel should be stored in the godown wherein humidity should be controlled upto 60% with the help of de-humidifiers, electric heaters or equivalent means. Hygrometers should be installed in such godown to check humidity.
Just enough quantity of strand/HT wire sufficient to last for 4 weeks or so should be ordered.</td><td>IRC:18-2000
Appendix-3</td></tr>
<tr><td>3.</td><td>Grouting of Post-Tensioned Pre-stressing cables.</td><td>The grout protects the pre-stressing steel and ensures encasement of steel in an alkaline environment for corrosion protection and by filling the space, it prevents water collection and freezing.
• For effective protection, recommended practice stipulated in MC:18:2000 -Appendix - 5, in respect of materials, grout vents, equipment, properties of the grout, mixing and grouting operations etc, shall be followed.</td><td>IRC:18-2000</td></tr>
</table>

Sr. No.	Parameters	Requirement	Reference
		• Grouting shall be carried out as early as possible but not later than 2 weeks of stressing a tendon. Whenever this stipulation cannot be complied with for unavoidable reasons, adequate temporary protection of the steel against corrosion by methods or products which will not impair the ultimate adherence of the injected grout should be ensured till grouting. The sealing of the anchorage ends after concreting is considered to be a good practice to prevent ingress of water. For structures in aggressive environment, sealing of the anchorage ends is mandatory. • No admixture containing chloride of any sort shall be used in grout. • Water cement ratio should not be more than 0.40 • Temperature of grout should not be more than 25°C. Use ice to maintain the temperature. • Power driven equipment should be used for grouting the cables. • Grout cap should be used to provide protection to the anchorage elements. • Should be supervised by Senior engineers. There is tendency to leave it to junior staff since it is a low value, last item.	
D. OTHER DETAILS			
1.	Deck slab	Water proofing membrane of mastic of MOSRT&H minimum thickness of 12 mm should be specification provided under the wearing coat to prevent ingress of water in the deck slab and corrosion of cables and rebars.	MoSRT&H Specification Clause 2702.1.1
2.	Railing	Provide mild steel post and pipe railing and paint them periodically.	IRC:5-1998
3.	Crash Barrier	Crash Barrier of desired height with or without pipe	IRC:5-1998

Annex-II

IRC: SP: 80 – 2008
Revised Table 5.1

S. No.	Parameters	Requirement		Reference
A. DESIGN STAGE				
1.	Crack width	• Crack width under quasi-permanent load combination shall not exceed 0.3 mm for moderate, severe and very severe conditions of exposure and 0.2 mm for extreme conditions of exposure for reinforced and pre-stressed members with un-bonded tendons. • Crack width under frequent load combination for pre-stressed members with bonded tendons shall not exceed 0.2 mm in all conditions of exposure.		IRC:112 Clause 12.3 (Table 12.1)
2.	Minimum Cover for Reinforcement	Exposure Moderate	Nominal Cover (in mm) 40	IRC:112 Clause 14.3.2 (Table 14.2)

S. No.	Parameters	Requirement		Reference
		Severe	45	
		Very severe	50	
		Extreme	75	
		(Note: The above cover may be reduced by 5 mm for factory made precast concrete elements, high performance concrete, use of stainless steel reinforcement, or controlled permeable formwork. In case more than one of the above measure is adopted, the reduction should not exceed 10 mm.)		
3.	Minimum Cover for pre-stressing steel and spacing	• For post-tensioned tendons, the minimum cover measured from outside of sheathing shall be 75 mm. • For pre-tensioned tendons, the minimum cover shall be 65 mm. • Minimum horizontal clear spacing of 50 mm or diameter of the duct, whichever is greater, shall be maintained between individual post tensioning cables. • Minimum vertical clear spacing of 50 mm or diameter of the duct or aggregate size + 10 mm, whichever is greater, shall be maintained between individual post- tensioning cables. • In case of pre-tensioning cables, the minimum clear horizontal spacing of individual cables shall be highest value of aggregate size + 10 mm, 2 times of tendon diameter and 20 mm. The minimum vertical spacing shall be greater value of aggregate size + 10 mm, 2 times diameter of tendon.		IRC:112 Clause 14.3.2 (Table 14.2), Clause 15.3.1.3 (Fig. 15.9 & 15.10)
4	Bundling of High Strength Deformed Bars, Pre-stressing Tendons and Grouping of cables	• In a bundle, all bars shall be of the same characteristics, type and grade and preferably same diameter. Bars of different diameters can be bundled provided the ratio of diameters does not exceed 1.7. Further details can be obtained from clause 15.2.7 of IRC:112 • In case of post-tensioned bonded cables, bundles of more than two ducts are not permitted. A pair of ducts placed horizontally or vertically touching each other may be permitted only in straight portion of the cable subject to following stipulations : a) Two cables can be grouped horizontally provided each duct diameter is not more than 50 mm. b) Two cables can be grouped vertically provided each duct diameter is not more than 110 mm. c) Two cables shall not be bundled over the curved length of cable in the plane of curvature.		IRC:112 Clause 15.2.7, Clause 15.3.1 & Fig. 15.9
5	Proper detailing and spacing of steel	Attention should be given to detailing to ensure proper concretability, use of vibrators etc.		
B. MATERIALS				
1	• Coarse aggregates • Fine Aggregates	• The preferred nominal size of aggregate is 20 mm for pre stressed and reinforced concrete. It should consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone, crushed gravel, natural gravel or a suitable combination thereof or other approved inert material. It should not contain dust, lumps, soft or flaky particles, mica and other deleterious materials. • Fine aggregates shall consist of hard, strong, durable clean particles of natural sand, crushed stone or gravel or suitable combination of natural sand and crushed stone or gravel.		IRC:112 Clause 18.4.4.2

<table>
<tr><th>S. No.</th><th>Parameters</th><th>Requirement</th><th>Reference</th></tr>
<tr><td>2</td><td>Water</td><td>Should not contain injurious amounts of oil acids, alkalis, sugar and organic materials, which may be deleterious to concrete and steel.
Permissible limits of solids shall be as under:
Organic-200 mg/l
Inorganic-3000 mg/
Sulphates-400 mg/l
Cholorides-2000 mg/l for concrete work not containing embedded steel and 500 mg/l for pre-stressed/ reinforced concrete work
Suspended matter-2000 mg/l
• pH Value- not less than 6
• Use of Sea Water is not allowed</td><td>IRC:112</td></tr>
<tr><td>3</td><td>Reinforcement</td><td>• Following grades of reinforcement steel shall be used:
<table>
<tr><th>Type of steel</th><th>Grade / Designation</th><th>Relevant BIS Standard</th><th>Minimum Yield Stress/0.2% proof-stress f_{yk}</th><th>Minimum Tensile Strength, as % of the actual 0.2% proof stress/yield stress but not less than</th><th>a Min.% elongation</th></tr>
<tr><td rowspan="2">Mild Steel</td><td rowspan="2">Grade-1</td><td rowspan="2">IS:432 (Part-1)-1982</td><td>Bars upto & including 20 mm dia. = 250 MPa</td><td>410 MPa</td><td>23</td></tr>
<tr><td>20mm ≤dia 50mm 240 MPa</td><td>410 MPa</td><td>23</td></tr>
<tr><td rowspan="7">High Yield Strength Deformed Steel (HYSD Steel)</td><td>Fe 415</td><td rowspan="3">IS:1786</td><td rowspan="3">415 MPa</td><td>110% (not less than 485 MPa)</td><td>14.5</td></tr>
<tr><td>Fe 415D</td><td>112% (not less than 500 MPa)</td><td rowspan="2">18.0</td></tr>
<tr><td>Fe 415S</td><td>≥125%</td></tr>
<tr><td>Fe 500</td><td rowspan="3">IS:1786</td><td rowspan="3">500 MPa</td><td>108% (not less than 545 MPa)</td><td>12.0</td></tr>
<tr><td>Fe 500D</td><td>110% (not less than 565 MPa)</td><td rowspan="2">16.0</td></tr>
<tr><td>Fe 500S</td><td>≥125%</td></tr>
<tr><td>Fe 550</td><td rowspan="2">IS:1786-2000</td><td rowspan="2">550 MPa</td><td>106% (not less than 585 MPa)</td><td>10.0</td></tr>
<tr><td>Fe 550D</td><td>108% (not less than 600 MPa)</td><td>14.5</td></tr>
<tr><td></td><td>Fe 600</td><td>IS: 1786-2000</td><td>600 MPa</td><td>106% (not less than 600 MPa)</td><td>10.0</td></tr>
</table>
Notes:
(1) Elongation on a gauge length of 5.65 √A, where A is the cross-sectional area of the test piece, when tested in accordance with IS 1608-1995
(2) For seismic zones III, IV & V; HYSD steel bars having minimum elongation of 14.5 percent and conforming to other requirements of IS 1786 shall be used.
• Products with improved corrosion resistance
a) Galvanised reinforcement
b) Epoxy-coated reinforcement
c) Stainless steel reinforcement</td><td>IRC:112
Clause 18.2.3 (Table 18.1)</td></tr>
</table>

AMENDMENT

<table>
<tr><th>S. No.</th><th>Parameters</th><th>Requirement</th><th>Reference</th></tr>
<tr><td>4</td><td>Concrete (Water Cement Ratio, Cement Content, Grade of Concrete)</td><td>Cement content (excluding fly-ash, GGBS or Silica Fume) shall not exceed 450 kg/m^3 of concrete
Maximum water cement ratio, minimum cement content and minimum grade of concrete for various structural members under different exposure conditions for concrete with 20 mm size aggregate shall be as under:
<table><tr><th>Exposure Condition</th><th>Maximum Water Cement Ratio</th><th>Minimum Cement Content (Kg/m^3)</th><th>Minimum Grade of Concrete</th></tr><tr><td>Moderate</td><td>0.45</td><td>340</td><td>M 25</td></tr><tr><td>Severe</td><td>0.45</td><td>360</td><td>M 30</td></tr><tr><td>Very Severe</td><td>0.40</td><td>380</td><td>M 40</td></tr><tr><td>Extreme</td><td>0.35</td><td>400</td><td>M 45</td></tr></table>(Note: The term cement for maximum water cement ratio and minimum cement content in the above table includes all cementitious materials inclusive of additions. For plain cement concrete, with or without surface reinforcement, the maximum grade of concrete can be lowered by 5 MPa and maximum water cement ratio exceeded by 0.05.)
Sulphate Content (SO_3) shall not exceed 4% by mass of cement used in the mix of concrete.
Chloride content in concrete shall not exceed following value by mass of cement:
Pre-stressed Concrete - 0.10 %
Reinforced Concrete in severe, very severe and extreme exposure conditions - 0.20 %
Reinforced Concrete in moderate exposure condition - 0.30 %
The above value shall be respected in case of HPC also</td><td>IRC:112 Clause 14.3.2 (Table 14.2 & 14.3) RC:SP:70-2016</td></tr>
<tr><td>5</td><td>Sheathing</td><td>• HDPE Sheathing ducts
1. Use Corrugated HDPE Duct. They are especially recommended to serve as barrier to externally penetrating chlorides/sulphates.
2. The wall thickness of the duct as manufactured shall be 2.0 mm, 2.5 mm, 3.0 mm and 4.0 mm for ducts of internal diameter upto 50 mm, 85 mm, 100 mm and 125 mm respectively. The minimum residual wall thickness after loss (wear resistance) shall not be less than 1.5 mm for ducts upto 85 mm in diameter and not less than 2.0 mm for ducts greater than 85 mm in diameter.
• MS Sheathing ducts
1. Unless otherwise specified, the material shall be Cold Rolled Cold Annealed (CRCA) Mild Steel intended for mechanical treatment and surface refining but not for quench hardening or tempering.
2. The material shall be clean and free from rust and normally of bright metal finish. However, in case of use in aggressive environment glavanised or lead coated mild steel strips shall be adopted.
3. The thickness of metal sheathing shall not be less than 0.3mm, 0.4mm and 0.5mm for sheathing ducts having internal diameter upto 50mm, 75mm and 90mm and above respectively. For larger diameter ducts, thickness of sheathing shall be based on recommendations of pre-stressing system supplier.</td><td>IRC:112 Clause 13.4.2 and 13.4.3</td></tr>
</table>

S. No.	Parameters	Requirement	Reference
C. Construction Stage			
1.	Curing	Concrete shall be kept constantly wet for a minimum period of 14 days. Liquid membrane-foaming curing compounds conforming to ASTM 309 may be used in lieu of moist curing after approval. Steam curing under atmospheric pressure is adopted to develop high early strength of concrete and is particularly suitable for precast concrete members.	IRC:112
2.	Storage and Handling of Pre-stressing Material	All pre-stressing elements such as strands/wires, anchorages, ducts, couplers, shall be protected from corrosion at all times. These materials should be stored in such a way that there is no deterioration in quality and usage in the work. These should be protected from rain, damp ground and from ambient atmosphere if it is likely to be aggressive by covering them properly.	MoRT&H Specification
3.	Grouting of Post-Tensioned Pre-stressing cables	The purpose of grouting is to provide permanent protection to the post-tensioned steel against corrosion and to develop bond between the pre-stressing steel and the surrounding structural concrete. The grout ensures encasement of steel in an alkaline environment for corrosion protection and by filling the duct space it prevents water collection and freezing. For effective protection, recommended practice stipulated in Clause 18.7 of IRC:112, in respect of materials, properties of the grout, mixing and grouting operations etc, shall be followed.	IRC:112
4	Protection of Post Tensioned Tendons and Anchorages	In order to achieve a durable post-tensioning system, matching with the design service life of the structure, suitable corrosion protection of the post-tensioning system, is necessary. The corrosion protection system shall take into account: a) Temporary protection of the tendons, ducts, anchorages and all accessories from manufacture handling storage, transport, till incorporation in the structure. b) Semi-permanent protection of the system in situations where the tendons and anchorages are exposed to atmosphere for an extended period of time. c) Permanent protection of pre-stressing system applied either at the factory or at site shall be according to stressing of the surrounding. Special care is warranted since most parts of the tendons or other component are generally not accessible during service life.	IRC:112 Clause 13.7
5	Protective Grouting	a) Post tensioned tendons shall be bonded to concrete of the pre-stressed member as well as protected from corrosion by cement grout which shall fill the ducts fully, without leaving any entrapped air or water pockets, voids created by evaporation of excess water in the grout and bleeding. b) Unbonded tendons placed either in ducts embedded in concrete or externally located shall be protected from corrosion by suitable fillers. Grouting by cement, wax, nuclear grade (low sulphur) grease are some of the options. For materials other than cement or such long life permanent materials, arrangements for inspection and refilling or replacement of grouting materials shall be made. Factory made coated wires/strands embedded in polyethylene ducts with suitable fill are acceptable. Manufacturer's recommendations shall be followed for the specialist materials and techniques.	IRC:112-2011 Clause 13.6
D. OTHER DETAILS			
1.	Additional measures for concrete members	• Use of Water proofing membrane over bridge deck to prevent ingress of water. • Use of surface coatings to the concrete to inhibit the ingress of chlorides or carbon dioxide. • Use of controlled permeability formwork (CPF) liners, which effectively reduce the water-cement ratio of cover concrete and reduce the chloride diffusion into the concrete.	IRC:112-2011 MoRT&H Specification
2.	Railing and Crash Barrier	Design and type of Railing and Crash Barrier be provided in accordance with IRC:5 and MoRT&H Specification.	IRC:5 MoRT&H Specification

AMENDMENT

Annex-III

IRC: SP: 80 – 2008

Table 6.6

SI. No.	Parameter	Requirement	Reference
1	Specific Gravity	1.35 to 1.40	IS 345
2	Solid Contents	70 ± 3 %	IS 345
3	UV Resistance	No Colour Change	ASTM G-53 / DIN EN 150-105
4	IR-Spectrum	Acrylic Polymer	IR Spectrometer Standards
5	Adhesion with Concrete	1.5 N / mm^2	ASTM D 4541-02 / DIN 50014
6	Dry Film Thickness	200 – 225 Microns (for Minimum 2 Coats)	
7	Coverage	400 to 450 gm / m^2 (in 2 Coats)	
8	Diffusion Resistance against CO_2	Equivalent Air Layer Thickness, S_DCO_2 shall be > 50 m	DIN 53122 Part I
9	Diffusion Resistance against H_2O	Equivalent Air Layer Thickness, $S_DH_2O$shall be < 4 m	DIN 52615
10	Water proofing charecterstics	Percentage reduction in flux should be > 50%	
11	Re-coatability	Min. 2 h to 72 h or as per manufacturer's specification with the approval of the Engineer in Charge	

Annex-IV

IRC: SP: 80 – 2008

Revised Table 6.6

SI. No.	Parameter	Requirement	Reference
1	Specific Gravity	1.35 to 1.40	IS 345
2	Solid Contents	70 ± 3 %	IS 345
3	UV Resistance	No Colour Change after minimum 400 hours exposure	ASTM G-53 / DIN EN 150-105
4	IR-Spectrum	Acrylic Polymer	IR Spectrometer Standards
5	Adhesion with Concrete	> 1.5 N / mm^2	ASTM D 4541-02 / DIN 50014
6	Dry Film Thickness	200 – 225 Microns (for Minimum 2 Coats)	
7	Coverage	400 to 450 gm / m^2 (in 2 Coats)	
8	Diffusion Resistance against CO_2	Equivalent Air Layer Thickness, S_DCO_2 shall be > 50 m	DIN 53122 Part I
9	Diffusion Resistance against H_2O	Equivalent Air Layer Thickness, S_DH_2O shall be < 4 m	DIN 52615

10*	Water Permeability of Coating	w< 0.1 kg/m^2 . h$^{0.5}$	EN 1062-3-2008 or similar
11	Re-coatability	Min. 2 h to 72 h or as per manufacturer's specification with the approval of the Engineer in Charge	
12	Tensile Strength	> 1.5 N / mm^2	ASTM D 638
13	Elongation	> 200%	ASTM D 638
14	Salt Spray Test	Pass: No Damage or Blistering after atleast 400 Hours Exposure	ASTM B 117
15	Crack Bridging Capacity	> 2.0 mm	ASTM C1305 – 2008

Notification No.19

Amendment No.1/IRC:SP:65 /November, 2018 (Effective from 31st January, 2019)

To

IRC:SP:65-2018 "Guidelines for Design and Construction of Segmental Bridges (First Revision)"

S.N.	Clause No. Page No.	For	Read
1.	3.2.1 (Page 3)	The stresses at the least compressive face under Rare Combination of Loads shall be limited to minimum residual compression of 0.5 MPa in case of epoxy jointed precast segments.	The stresses at the least compressive face under Rare Combination of Loads shall be limited to minimum residual compression of 0.5 MPa at joint locations in case of epoxy jointed precast segments.
2.	3.2.2 (Page 3)	The limits specified in clause 12.2.2 of IRC:112 apply to all types of segmental bridges except longitudinal reinforcement of precast segmental bridges, where these stress checks have no relevance.	The limits specified in clause 12.2.2 of IRC:112 apply to all types of segmental bridges except in the longitudinal reinforcement of precast segmental bridges, where these stress checks have no relevance.
3.	3.3 (Page 3 & 4)	The crack width limitations given in clause 12.3 of IRC:112 apply to all types of segmental bridges except at joints of precast segmental structure where minimum compressive stress limitations of para 3.2.1 above apply. The decompression limits of Table 12.1 of IRC:112 apply to Prestressed members with bonded tendons.	The crack width limitations given in clause 12.3 of IRC:112 apply to all types of segmental bridges except at joints of epoxy jointed precast segmental structure where minimum compressive stress limitations of para 3.2.1 above apply. The decompression limits of Table 12.1 of IRC:112 apply to Prestressed members with bonded tendons for structures built in severe, very severe and extreme environmental conditions.
4.	3.5.2.2 Page (4)	For Structure with external unbonded tendons, the shear resistance shall be calculated as per clause 10.3.3.4 (2) of IRC:112. For this purpose, the equation 10.18 of IRC:112 shall be modified as follows: $V_{NS}/0.85 = V_{ED} < h_{redc} b_w v f_{ed} / (\cot\theta + \tan\theta)$ And equation 10.19 modified as follows: $A_{SW}/S = V_{ED}/h_{redc} v_{fed} \cot\theta$	For Structure with external unbonded tendons, the shear resistance shall be calculated as per clause 10.3.3.4 (2) of IRC:112.